

1. Parts of a Light Microscope

The Light Microscope

Objective lens:
what we change depending on how magnified we need the object.

Stage: platform to place the slide on to view the object.

Lamp: provides light so that the image can be seen.



Eyepiece lens:
what the scientist looks through.

Coarse adjustment:
large adjustment to focus the object.

Fine adjustment:
very small adjustment to the focus.

2. Using a microscope

3. Start on the lowest objective lens

1. Place the slide on the stage

2. Turn on the lamp

4. Look through the eyepiece lens

5. Use the coarse adjustment to move the image closer

6. Use the fine adjustment to focus the image

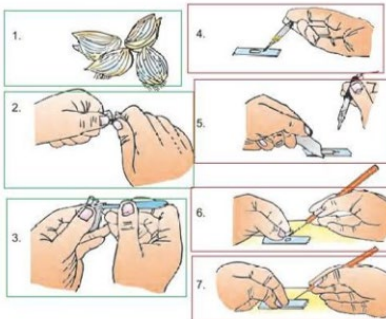


3. Preparing a slide of onion cells

1 Slice open the onion

2 Cut a piece of onion

3 Using forceps, take a thin slice of the onion

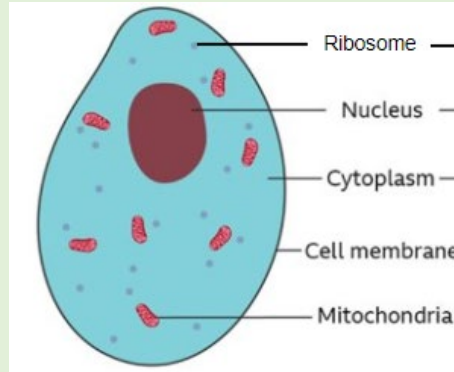


4 Place flat on a glass slide

5 Add a drop of iodine

6 Cover with a cover slip

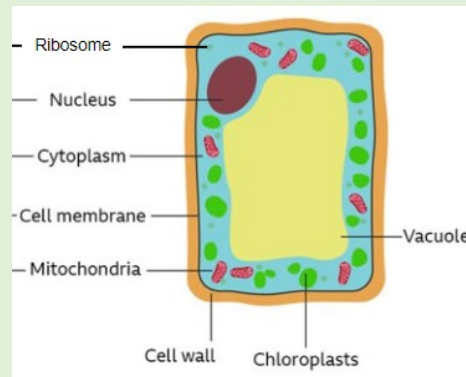
4. Animal cell



KS3 Science

Cells and Organisation

5. Plant cell



6. Organelle Functions

Animal and plant cells

Cell membrane – controls what enters and exits the cell.
Nucleus – contains DNA, the genetic information that cells need to function.

Cytoplasm – this is a jelly-like substance in which chemical reactions happen.

Mitochondria – the site respiration.

Ribosomes – the site where proteins are made.

Plant cells only

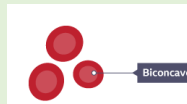
Cell wall - this surrounds the cell and gives it support.

Vacuole - contains sap which gives the plant cell support.

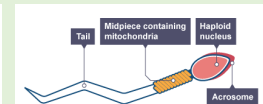
Chloroplasts - these are the site of photosynthesis.

7. Specialised Cells

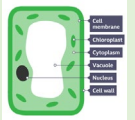
Specialised cell: a cell with a specific role to perform.



Red blood cells – transport oxygen around the body.



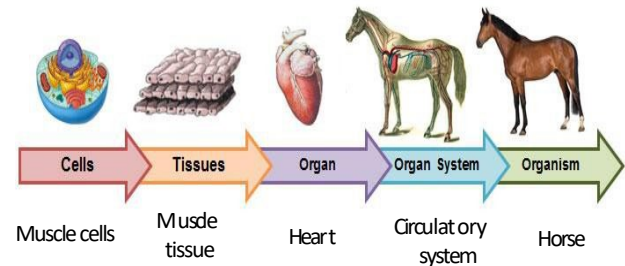
Sperm cell – male reproductive cell.



Palisade cell – form the leaf of a plant.

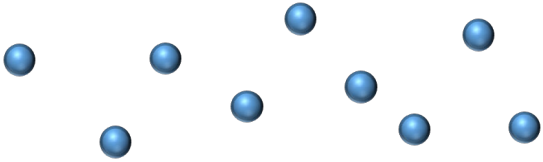
8. Levels of organisation

In the human body, structures are related and form larger structures.



1. Particles

- Everything is made up of **tiny particles**.
- The **properties** of a substance depend on what its particles are like, how they move and how they are arranged.
- The particles in a substance are the same whether it's in the solid, liquid or gas state, but their **arrangement and movement** change.



2. States of matter

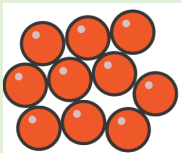
Solid

Steel, plastic and wood are solids at room temperature. Ice is solid water.



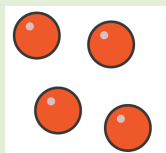
Liquids

Mercury, petrol and water are liquids at room temperature.



Gases

Air, helium and chlorine are gases at room temperature.



3. Arrangement and movement of particles

Solids

In the solid state the **vibrating** particles form a **regular pattern**. This explains the fixed shape of a solid and why it can't be compressed or poured.

Liquids

In a liquid the particles still touch their neighbour's, but they **move around, sliding over each other**. This is why you can pour, but not compress, a liquid.

Gases

In the gas state, **widely-spaced particles move around randomly**. This explains why you can compress gases and why they flow.

4. Movement of particles (energy)

Another way to understand solids, liquids, and gases is by thinking about the energy they contain. A balloon full of gas has molecules dashing about inside it, smashing repeatedly into the rubber walls and pressing them outward. Balloons stay up because the force of the gas molecules pushing against the inner surface of the rubber exerts a pressure that's equal to the pressure of the air molecules pushing on the rubber from outside. If the gas loses energy the particles move less and less they will then turn into a liquid. The particles are still moving but not as quick as when the particles were a gas. Remove more energy and the particles will stay in a fixed place and become a solid. The particles still contain energy, but just vibrate in their fixed position.

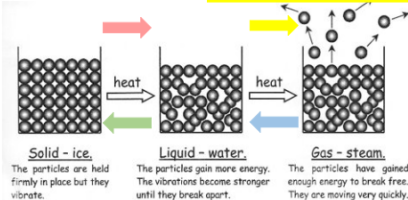


KS3 Science Particles

5. Changing states

Melting is the process in which a solid is changing to a liquid.

Evaporation is the process in which a liquid is changing to a gas.

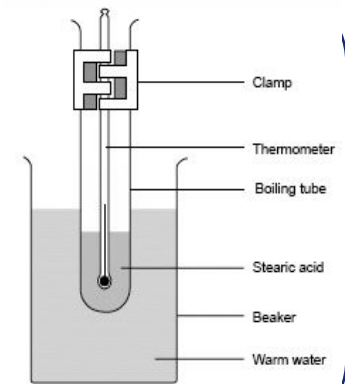


Solidifying is the process in which a liquid is changing to a solid.

Condensing is the process in which a gas is changing to a liquid.

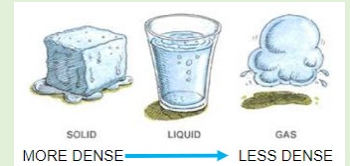
6. Stearic acid experiment

Stearic acid has a melting point of 69.3 °C. In this experiment you will take the temperature of stearic acid at regular intervals as you heat and cool it. You will observe the temperature change as it changes state.



7. Particles and density

Density means how closely particles are packed together in a substance.



Calculating density:

$$\text{Density} = \frac{\text{mass}}{\text{volume}}$$

(kg/m³) (kg) (m³)

A 500kg block has a volume of 100m³. Calculate its density.

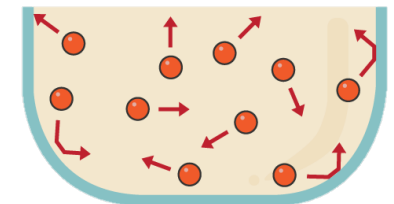
$$\text{Density} = \frac{\text{mass}}{\text{volume}}$$

$$\text{Density} = 500 / 100$$

$$\text{Density} = 5 \text{ kg/m}^3$$

8. Gas Pressure

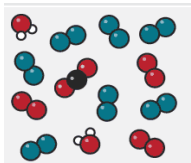
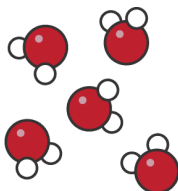
The particles in a gas move quickly in all directions, but they do not get far before they bump into each other or the walls of their container. When gas particles hit the walls of their container, they cause pressure. If the temperature is increased, the particles in a gas move faster, so they hit the walls of the container more often. This causes the pressure to rise. This is also why the pressure of a gas also increases when the volume of its container is decreased.



1. Pure vs Impure

Pure Substances

A substance made up of **one type** of particle e.g. hydrogen gas or oxygen gas.



Impure Substances

A substance made up of **mixtures** of different types of particle e.g. bottled water.

2. Mixtures

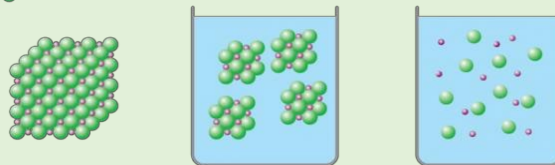
A **mixture** contains two or more substances, not chemically joined together, which can be **separated**.

For example, a packet of sweets may contain a mixture of different coloured sweets. The sweets are not joined together, so can be picked out and separated.



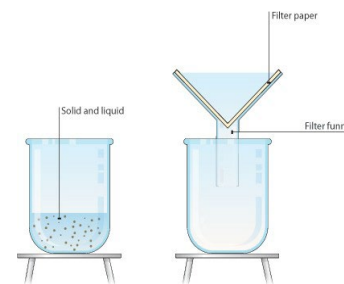
4. Dissolving

During dissolving, the **solvent particles** surround the **solute particles** and move them away so they are spread out in the **solvent**.



Solubility is a measure of how easy it is for a given substance to dissolve.

6. Filtration



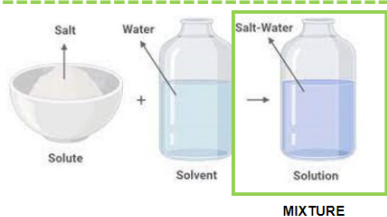
If you have a **mixture** of an **insoluble** solid and a liquid then the mixture can be **filtered** (eg. sand in water).

If separating sand from water, the sand (**residue**) stays behind in the filter paper and the water (**filtrate**) passes through the filter paper. Water molecules are small enough to fit through the filter paper.

3. Solutions

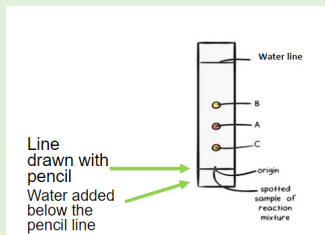
solute + solvent = solution
(solid) (liquid) (mixture)

e.g., salt + water = solution



5. Chromatography

A method for separating a mixture of liquids based on their solubility. As the solvent (water) moves up the paper, it carries the mixture with it. Different substances in the mixture will move at different rates due to **solubility** and separate.



8. Crystallisation

Crystallisation is used to produce solid **crystals** from a **solution**. When the **solution** is warmed, some of the **solvent** (liquid) **evaporates** leaving behind a more **concentrated solution**.



To obtain **large** crystals, **evaporate** slowly.
To obtain **small** crystals, **evaporate** quickly using a Bunsen burner.

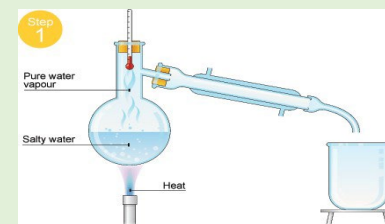


KS3 Science

Separating Techniques

7. Distillation

Used to separate a liquid from a solution.



Water **evaporates** from the **solution**, but is then cooled and **condensed** into a separate container. The salt does not **evaporate** and so it stays behind. **Distillation** can also be used to separate two liquids with different **boiling points** (eg. orange squash or inky water). This is because the one with the lower boiling point will **evaporate** and **condense** first.